

Thyroid

Half white.

13.

ON THE
NAKED-EYE AND MICROSCOPICAL VARIATIONS
OF THE
HUMAN THYROID BODY.

BY
W. HALE WHITE, M.D.

Read March 13th, 1888.

*From Vol. LXXI of the 'Medico-Chirurgical Transactions,' published
by the Royal Medical and Chirurgical Society of London.]*

LONDON:
PRINTED BY
ADLARD & SON, BARTHOLOMEW CLOSE.

1888.

ON THE
NAKED-EYE AND MICROSCOPICAL VARIATIONS
OF THE
HUMAN THYROID BODY.

BY
W. HALE WHITE, M.D.

Received January 8th—Read March 13th 1888.

THE object of the present paper is to try to discover how much the thyroid body may vary in persons who have not died from diseases in which, as far as our present knowledge goes, that organ is affected. The thyroid bodies taken indiscriminately from forty patients have been examined, and in order to prevent any bias I have not ascertained the disease from which the patient suffered till after the description of the thyroid was completed. Twenty-one were males, sixteen were females, and in three the sex was not stated.

In twenty cases the largest transverse section obtainable was taken ; the size of the section was found to vary very much, but owing to the different shapes, which were either more or less square, elongated, triangular or crescentic, the areas could not be measured.

The youngest patient examined was a male child aged

six months, the eldest a female aged seventy-seven years. Arranging the ages in a series according to the size of the transverse section, we find that the average age of the ten patients with the largest sections was thirty-eight years, of the ten with the smallest fifty-seven years. If we eliminate the child the youngest was twenty-eight years, then the average age for the larger glands is forty-two years against fifty-seven for the smaller. Thus it appears that the gland becomes smaller in old age. This is supported by the fact that one of the smallest was from the woman aged seventy-seven.

No connection could be discovered between the size of the gland and the disease from which the patient suffered.

Sometimes the vesicles are so minute as to be but little more than a ring of epithelial cells, and the whole section may contain nothing but these, whilst on the other hand there is hardly any limit to their size. The largest I met with were a tenth of an inch in diameter. It is not usual to find large and small vesicles both present in the same section, although to this there are many exceptions. A common size is $\frac{1}{25}$ th of an inch in diameter. One does not find large vesicles in small glands, but one often finds small vesicles in large glands. I am quite unable to connect the size of the vesicle with any particular disease.

The type of the cells lining the vesicle is rectangular, taller than wide, with a large, oval, deeply-staining nucleus. Often they are quite flat, being considerably wider than they are high. This is so frequently associated with distension of the vesicle with secretion that the increased pressure seems to be the cause of the flattening. Often they are so flat that they are difficult to recognise. It is not easy to understand how secretion can have gone on under such an adverse pressure, but there are many instances in disease of a similar difficulty. When the vesicles are extremely distended they are often polygonal from the increased pressure. The contents of the vesicle have often shrunk away from its wall; some-

times they have taken with them the cells, usually called epithelial, which line the vesicle. I have not been able to determine the cause of this condition.

The epithelial cell takes the logwood stain poorly, but the nucleus, which has many nucleoli, takes it deeply. The nuclei are sometimes so large that they are contiguous and the cell-substance cannot be seen. The result is that the vesicle is lined by a number of darkly-stained oval bodies which look like leucocytes, but which from their regular arrangement, and from the presence of transition stages we must regard as nuclei; this is most often seen in thyroids having small numerous vesicles and but rarely when the vesicles are large and well distended.

I have, in a male aged thirty-four who died of heart disease, in a male aged forty-one who died of urethral stricture, and in a female aged fifty who died of cancer of the breast, seen a few vesicles having their epithelial lining involuted; sometimes the involutions are opposite so that a considerable constriction is caused. This has been noticed by several observers, and is usually looked upon as a persistence of the condition in which the gland was made up of a series of branching tubes.

Baber ('Phil. Trans.,' 1876, p. 563) has described parenchymatous cells which lie in groups between the vesicles. They are rounded and considerably larger than the epithelial cells; they are finely granular; each has a single nucleus staining darkly with logwood. Many of my sections show these cells. I cannot make out that the age, sex, or mode of death bear any relationship to the number of parenchymatous cells. My specimens support Baber's belief that these cells can make their way towards the vesicles through whose epithelial lining they may pass (Fig. 1) and thus become free in the vesicular cavity. When it reaches the colloid substance each cell forms for itself a concave depression. If a number of these are of equal size and arranged around the colloid matter it has the appearance of a toothed disc (Fig. 2). If they are more irregular it has a nibbled

appearance. This is very common and is best seen in medium-sized vesicles. It is never seen in the very large ones which are much distended with colloid material or in the very small ones which have hardly any. There are all gradations from this condition to that in which the vesicle contains nothing but granular *débris* with some nuclei scattered about in it, from which it would seem probable that the parenchymatous cells, having passed into the vesicle and destroyed the colloid matter, break up into granular *débris*. This view is supported by the fact that sometimes the parenchymatous cells will be seen to have lost part of their substance.

Sometimes there may be seen in the cavity of the vesicle bodies which are in all probability leucocytes that have wandered through the epithelial lining, but which it is difficult to distinguish from parenchymatous cells which have lost some of their cell-substance. While I think that Baber is right in his belief that leucocytes can pass through the epithelial lining I have never seen red blood-corpuscles in the vesicular cavity, but, from the brownish-red colour of its contents that one often sees, I should think that they also may find their way into the vesicle. The coarsely granular *débris* I have just described must be distinguished from the faintly granular appearance sometimes presented by the colloid matter itself. No one seeing the two conditions can possibly confound them.

As, in some vesicles in which there is much granular *débris*, the epithelium with which it is in contact is blurred or has even completely disappeared, it is possible that this granular *débris* may have been partly produced by the epithelium. The absence or altered appearance of the epithelium may, however, have been caused by the immigration of the parenchymatous cells.

I have roughly grouped my cases into those in which the granular condition was the striking characteristic, and those in which the large amount of colloid matter was the leading feature. There are seventeen in the first group and twenty-one in the second. I cannot make out any

difference between the two classes as regards age, sex, or mode of death.

Baber suggests ('Phil. Trans.,' 1881) that the alcohol into which the thyroid is placed causes the colloid material to shrink and that the space thus left is filled by clear fluid which, exuding from the epithelium in drops, causes the indentation on the colloid matter. This hardly seems probable, for, as his figures and mine show, even when the indentations are most marked the teeth of colloid material may reach to the epithelium, so that we must suppose that the shrinking took place in an indented manner. Then again this fluid must be supposed to be quite different from the colloid material which is usually secreted by the epithelium, for it does not stain. For neither of these suppositions is there any reason. Further also, if the alcohol caused the shrinking it would affect all the colloid matter equally. It seems to me that at present we do not know the cause of the shrinking, but that the indentations are undoubtedly caused by the parenchymatous cells (Fig. 2).

Human colloid material appears to be exactly similar to that of the animals usually examined for histological purposes. It is opaque, either uniform and deeply stained by logwood or faintly granular and slightly stained. The shrunken appearance and toothed edge have been mentioned; often there are one or more large rounded holes in it (Fig. 3). In nine out of the forty thyroids examined these were numerous. Probably they are due to the invasion of the colloid material by parenchymatous cells, whose track cannot be seen either because it has closed up or the section is not in the right plane. This is supported by the fact that parenchymatous cells may be seen lying in the colloid matter (Fig. 4), and no doubt they frequently drop out in cutting the section. The size of the holes is easily explained by the power of the parenchymatous cells to absorb the colloid matter. Thus these holes and the indentations have the same origin.

The thyroids from two patients, one of whom died from

puerperal eclampsia and pneumonia at the age of twenty-one and the other from phthisis, show in some of the vesicles the colloid matter with a most remarkable double concentric arrangement, the centre part being a disc of homogeneous colloid matter outside which is a ring not quite so wide as the diameter of the disc of material to which it appears to be similar, save that it was darkly stained; both inside and outside the ring was a narrow clear space (Fig. 5). This condition has been described by Zeiss.

In a few specimens I have found crystals (Fig. 6) in the colloid material. They were best seen in a male, aged fifty-three, who died from a fracture of the base of his skull, and in a male aged twenty-seven, the cause of whose death was pericarditis; none of them were sufficiently distinct for one to be quite certain of the name to give them, but they might well be either cholesterin or oxalate of lime, both of which have been described as present in the colloid matter. Occasionally a hole, from which presumably a crystal has dropped out, may be seen.

The parenchymatous cells are often grouped together in small collections in such a manner that if each collection had a drop of colloid matter in its centre it would be very difficult to distinguish it from a minute vesicle. Sometimes one sees minute vesicles in which the lining cells are larger than usual, and are in most respects like parenchymatous cells. Roughly speaking it may be said that the larger the vesicle the smaller the epithelium, and that the smaller the vesicle the more the epithelium approaches the type of parenchymatous cells. For these reasons I would suggest that one method at least by which vesicles are formed is by the grouping together of parenchymatous cells, in the midst of which a minute drop of colloid matter makes its appearance. As this increases in size the epithelium decreases, till at last it is quite flattened out. Baber says ('Phil. Trans.,' 1876) the points of distinction between the parenchymatous and epithelial cells are that the former are large, more or less

rounded, the nucleus is darker, and does not stain quite so deeply with hæmatoxylin. These points are hardly sufficiently distinctive, and fig. 9 appended to his paper shows how parenchymatous cells may vary, and that some of them much resemble epithelial cells.

Some sections show large numbers of leucocytes scattered about among the interstices of the interstitial tissue. This condition, which was present in association with many very different diseases, was extremely well marked in a case of erysipelas.

Septa of fibrous tissue are prolonged into the gland from the fibrous sheath enveloping it; between these septa is a delicate connective tissue supporting the vesicles and vessels. In some thyroids the septa are very distinct, and split the organ up into islets, in others the supporting tissue is more uniform, and no arrangement of the vesicles into islets can be seen. When the vesicles are very large there is but little connective tissue between them; this is apparently due to its atrophy, owing to the pressure exercised by the distended vesicles. Some sections consist almost entirely of distended vesicles polyhedral from mutual pressure.

I have found, among the specimens I have examined, one in which the organ was nothing more than fibrous tissue (Fig. 7). It was quite as atrophic and degenerate as the thyroid in myxœdema. The patient, a man aged forty-five, had an aneurysm which pressed upon the recurrent laryngeal nerve. The report of the case makes no mention of any myxœdematous symptoms. This case is of the greatest value, for it appears to teach that in man the thyroid may be exactly like that found in myxœdema, and yet there may be no myxœdema present, but if no other instances of this are recorded I think we shall have to regard it as probable that this patient had myxœdematous symptoms which escaped recognition during life. In some other thyroids among my slides there was a considerable amount of fibrous tissue. One was from a man aged fifty-four, who died of granular kidneys and cancer of the

pancreas, and the other from a man aged fifty-four, who died from aneurism of the aorta which also pressed upon the recurrent laryngeal nerve; in this case the organ only weighed nine grammes. These three cases show that at present we very much want a more thorough examination of the thyroid in order to make quite certain that myxœdema is the only disease that is associated with atrophy of that organ.

In the 'British Medical Journal' (1885, vol. ii, pp. 342, 1014), founding my conclusion largely on the two cases here mentioned, in which the recurrent laryngeal nerve was pressed upon, I suggested that it might be the trophic nerve to the gland. As Mr. Victor Horsley has divided this nerve in dogs without producing any effect on the gland, we may conclude that probably this nerve has no trophic influence upon it.

The state of dilatation of the lymphatics varies enormously, and cannot be associated with any particular disease, but it is noteworthy that the only case of erysipelas examined showed greater dilatation than any other case.

The contents of the lymphatics consist, like that of the vesicles, of colloid matter, sometimes homogeneous, sometimes faintly granular. Holes may rarely be present in it (Fig. 8), and parenchymatous cells may lie in them. The coarse granular débris is but seldom to be seen in the lymphatics, and then in but small quantities. It may have a brownish-red tint.

Thus it appears that colloid material, parenchymatous cells, and granular débris can all be taken up from the vesicles by the lymphatics. The contents of the lymphatics never have a toothed edge. Occasionally a distended lymphatic is seen completely surrounding a vesicle.

I have observed nothing noteworthy about the blood-vessels.

I have not come across anything that is obviously an undeveloped portion of the gland, but it is, I should think, very difficult to distinguish small undeveloped portions from small groups of parenchymatous cells.

All my sections were prepared in exactly the same way, so that the difference observed cannot be set down to the method of preparation, which was to harden the gland in Muller's fluid and spirit, and then to stain the sections with logwood and mount them in Canada balsam.

My object has been to supply what seemed to be a want, especially as the thyroid is now so important pathologically, namely, a description of the size, shape, and microscopical appearances of the human thyroid when prepared by the ordinary methods. I think I have shown that in all these respects the organ may vary very considerably, and that we cannot at present see the meaning of these variations, which are probably none of them due to post-mortem changes and method of preparation. In passing, I have been able to point out that some unexplained appearances, which are very rare in the thyroids of the lower animals, may be present in man, and lastly I have tried to prove that the indentations of the colloid material are produced, not, as has been formerly supposed, by the exudation of drops of fluid from the epithelial cells, but by the migration of cells into the vesicles and also that new gland vesicles may originate in parenchymatous cells.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' New Series, vol. ii, p. 357.)

DESCRIPTION OF PLATE I.

On the Naked-Eye and Microscopical Variations of the Human
Thyroid Body. (W. HALE WHITE, M.D.)

FIG. 1.—Parenchymatous cells forming depressions in the colloid matter, and wandering into it in large numbers.

FIG. 2.—The toothed-disc appearance of some of the colloid matter produced by the immigration of parenchymatous cells.

FIG. 3.—Holes in the colloid material.

FIG. 4.—Parenchymatous cells free in the colloid material of the vesicles.

FIG. 5.—The double contour arrangement of the colloid material.

FIG. 6.—A large crystal in the colloid material.

FIG. 7.—The fibroid condition of the thyroid in a patient who had not myxœdema.

FIG. 8.—Vacuoles in the colloid material of a lymphatic.

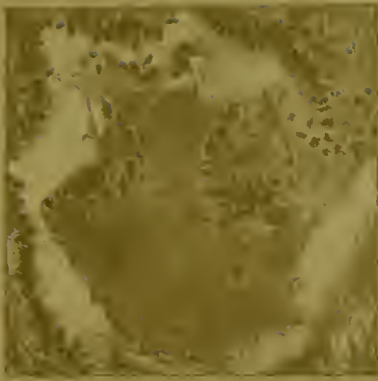


Fig 1

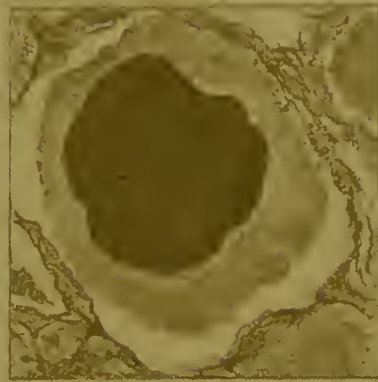


Fig 5

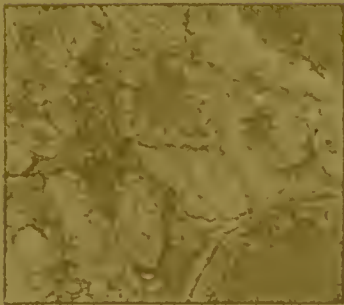


Fig 2.



Fig 6

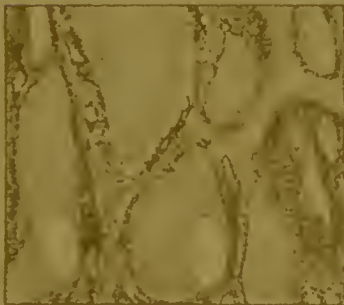


Fig 3

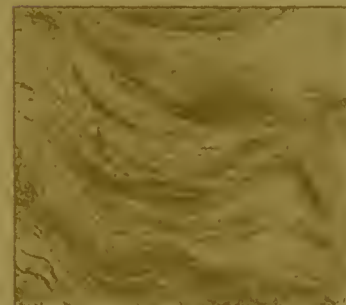


Fig 7

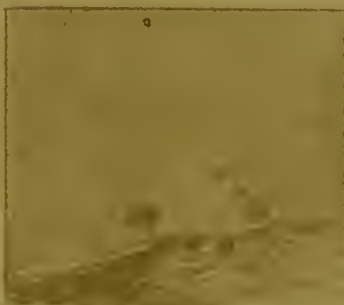


Fig 4

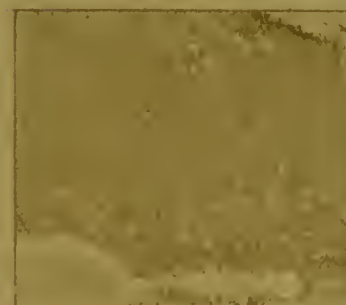


Fig 8

